# PATENT SPECIFICATION

NO DRAWINGS

**822,714**

*Date of Application and filing Complete Specification: Dec. 30, 1955.*

*No. 37477/55.*

*Complete Specification Published: Oct. 28, 1959.*

**Index at acceptance:—Classes 33**, A; **95**, B4(B:X); **and 99(2)**, P1B(5D:8).

**International Classification:—B05. E03f. F06b.**

COMPLETE SPECIFICATION

## Insulation for Underground conduits and method of producing the same

I, ALEXANDER CAMPBELL KIDD, of 362 Warwick Avenue, South Orange, in the County of Essex and State of New Jersey, United States of America, a citizen of the United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to insulation for pipes or conduits embedded in concrete or underground, which pipes or conduits are used for conveying or transporting steam, gas, oil, fresh water and sea water, both hot and cold, and encased electric conductors and the like, or lines for light, power or communication systems.

Among the objects of the present invention, it is aimed to provide an improved insulation barrier or enclosure for such pipes or conduits, which barrier and the method of producing the same is inexpensive and which will effectively resist corrosion from, and positively obstruct, water vapour, moisture, underground electric currents, soil chemicals, oils, fats, soil bacteria, fungi, termites and the like, and which will in turn also retard, if not entirely prevent, the dissipation of the heat in fluids being conveyed when the pipes or conduits are used for transporting fluids.

It is not new to embed pipes or conduits in protective material. In an endeavour to achieve the aforesaid result, the protective material heretofore used, however, has not only been expensive to produce, but unsatisfactory in many respects, as an instance, due to the bulk and weight of the same, and consequent excessive cost for transporting the same; due to the fact that it was frequently only obtainable in remote and inaccessible areas, the consequent excessive cost for long haul transportation of the same; and finally the inability of the same effectively to withstand corrosion and effectively to prevent the dissipation of the heat in the fluid being conveyed when the pipes are used for conveying hot fluids such as steam, hot water, and the like.

In the accompanying drawings:

Figure 1 is a cross section more or less diagrammatically showing a conduit embedded in concrete or underground, and Figure 2 is a fragmental section along the line 2—2 of Figure 1.

Referring to the drawings, the pipe or conduit 1 to be protected is embedded in concrete or underground, it being placed upon rigid metal supports 2, and then a mixture consisting of expanded perlite coated with a high softening point hydrocarbon, in the proportion of 10% by volume of the coating to the expanded perlite, and a high softening point hydrocarbon in a dry powdered state, poured around the pipe 1.

The aforesaid high softening point hydrocarbon is a by-product in the refinement of petroleum asphalt, generally known as a solvent precipitated asphalt resin.

The physical properties of the high softening point petroleum asphalt hydrocarbon in a dry powdered state are substantially as follows:

| | |
|---|---|
| Specific Gravity at 60° F. | 1.07—1.10 |
| Softening Point, in Fahrenheit degrees | 280—310 |
| Bitumen Soluble in $CCl_4$ | 99.0 |
| Optical Density | 373,000 |
| Acid Value | 0.4 |
| Saponification Number | 11.3 |

The perlite above referred to consists primarily of a volcanic rock or glass which is extensively found in the No Agua Mountains of Colorado, United States of America, and has a silica content of about 65% to 70% by weight, an alumina content of 12% to 16%, a water content of 2% to 6% and small amounts of the oxides of sodium, potassium,

[*Price 3s. 6d.*]

Price 25p

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SPECIFICATION NO. 822,714

INVENTOR:- ALEXANDER CAMPBELL KIDD

By a direction given under Section 17(1) of the Patents Act 1949 this application proceeded in the name of Insul-Fil Co., Inc., a Corporation organised and existing under the laws of the State of New Jersey, United States of America, of 250, Pettit Avenue, Bellmore, Long Island, County of Nassau and State of New York, United States of America.

THE PATENT OFFICE,

9th November, 1959

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ducing the same is inexpensive and which ... effectively resist corrosion from, and positively obstruct, water vapour, moisture, underground electric currents, soil chemicals, oils, fats, soil bacteria, fungi, termites and the like, and which will in turn also retard, if not entirely prevent, the dissipation of the heat in fluids being conveyed when the pipes or conduits are used for transporting fluids.

It is not new to embed pipes or conduits in protective material. In an endeavour to achieve the aforesaid result, the protective material heretofore used, however, has not only been expensive to produce, but unsatisfactory in many respects, as an instance, due to the bulk and weight of the same, and consequent excessive cost for transporting the same; due to the fact that it was frequently only obtainable in remote and inaccessible areas, the consequent excessive cost for long haul transportation of the same; and finally the inability of the same effectively to withstand corrosion and effectively to prevent the dissipation of the

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vent precipitated asphalt resin.

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The perlite above referred to consists primarily of a volcanic rock or glass which is extensively found in the No Agua Mountains of Colorado, United States of America, and has a silica content of about 65% to 70% by weight, an alumina content of 12% to 16%, a water content of 2% to 6% and small amounts of the oxides of sodium, potassium,

Price 25p

calcium and magnesium. This perlite ore, after having been crushed, graded and screened, is quick-heated to approximately 2000° F., when it will expand into glass-like beads or pearls of about ten to thirty times the original volume of the perlite ore as mined, each pearl being thus formed into a mass of air cells or voids which make the material not only light in weight but which effectively convert the same into a heat insulator to retard, if not entirely prevent, the dissipation of the heat from the pipe to be protected. In order to seal off these cells or voids against the entrance of water vapour and the like, the expanded perlite is coated with the same high softening point hydrocarbon, preferably by blowing the expanded perlite, at about 600° F., with the high softening point hydrocarbon in a dry powdered state. After the perlite ore has been heated to about 2000° F. and expanded, then it is allowed to cool until its temperature drops to about 600° F., when the high softening point petroleum asphalt hydrocarbon in a dry powdered form is blown onto the same, causing the hydrocarbon to fuse and coat the expanded perlite particles upon contact of the hydrocarbon on the expanded perlite particles. The heating of the perlite ore to achieve the desired expansion will preferably take place in a kiln at about 2000° F.

It will of course be obvious that when the temperature generated in the conduit 1 exceeds 200° F. and remains between 200° F. and 500° F., in actual practice about 400° F., it will cause the mixture of the high sofening point hydrocarbon in a dry powdered state and the coated perlite not only to fuse into the plastic annular zone 3, but also to adhere to the conduit 1 and the fringe of the sintered zone 4, and that the sintered zone 4 will gradually change into the unaffected or unconsolidated area or zone 5 where the mixture is neither fused nor sintered. Obviously from an initial temperature of about 400° F. at the pipe or conduit 1, the temperature will gradually diminish in a radially outward direction so that the temperature will approximate 350° F. on the outer face of the plastic zone 3, and will diminish still further to approximate 280° F. on the outer face of the sintered zone 4. Furthermore, with a temperature of about 400° F. at the pipe 1, zone 3 would be about one-half inch in depth radially and be plastic, zone 4 would be about four to six inches in depth and be sintered or coalesced into a substantially solidified mass which is impervious to moisture and provides excellent insulation against the transfer of heat under all conditions. The condition of zone 4 gradually changes into the condition of the area or zone 5, where the mixture is neither fused, that is, plastic, nor sintered, that is, solidified, but to all appearances practically unconsolidated or loose.

From the foregoing, it thus appears that the invention consists essentially in placing the pipe to be protected on supports in a ditch, or against spacers in the wall of a building, to space the pipes from the bottom of the ditch or the wall, thereupon to pour the mixture of expanded perlite coated with a high softening point petroleum asphalt and powdered high melting point petroleum asphalt into the ditch or wall space.

The insulation provided by the invention is not only effective against heat, but also constitutes an effective barrier to water vapour, moisture, stray electric currents, fats and oils, soil chemicals, soil bacteria, fungi, termites and the like. The insulation can therefore be used to encase electrical conductors and the like as well as to encase conduits conveying hot or cold fluids.

While the proportion of the quantity of coated expanded perlite relative to the powdered high softening point hydrocarbon may vary, excellent results have been achieved when the quantity of coated expanded perlite is about 50% by volume of the mixture with the powdered high softening point hydrocarbon. While the hydrocarbon in powdered form used for coating the expanded perlite may differ chemically from the powdered high softening point hydrocarbon with which the coated perlite is mixed in the final mixture, excellent results have been achieved when the high softening point hydrocarbon in powdered form which is blown on to the expanded perlite to coat the same, is the same chemically as the high softening point hydrocarbon with which the coated expanded perlite is mixed in the final mixture.

Where the coated expanded perlite is about 50% by volume of the entire mixture, the coating on the perlite amounts to about 5% by volume, the perlite without the coating amounts to 45% by volume.

WHAT I CLAIM IS:—

1. The combination of a metal conduit, an inner annular plastic layer of a mixture of a high softening point hydrocarbon and expanded perlite particles coated with a similar high softening point hydrocarbon in contact with and surrounding said conduit, and an outer substantially solidified layer of a sintered mass of said mixture.

2. The combination as set forth in claim 1 in which said inner layer is about one-half inch in depth and said outer layer is about four to six inches in depth.

3. The combination as set forth in claim 1 in which said high softening point hydrocarbon is a high softening point petroleum asphalt hydrocarbon and said perlite contains silica, alumina, water and the oxides of sodium, potassium, calcium and magnesium.

4. The combination as claimed in claim 1 in which the said outer layer has outside it a layer of said mixture where the dry powdered high softening point hydrocarbon and the

coated perlite are loosely mixed.

5. The method of encasing a hot medium-carrying conduit with an insulation consisting in embedding the conduit in a mixture of high softening point hydrocarbon and expanded perlite coated with a high softening point hydrocarbon, transmitting heat at a temperature of about 400° F. from said conduit to said mixture to form in turn an inner plastic cylindrical layer of said mixture in contact with said conduit, an intermediate substantially solidified cylindrical layer of said mixture merging into said inner layer, and an outer cylindrical layer of said mixture in a free and loose state.

6. The method as set forth in claim 5 in which said inner layer is about one-half inch in depth and said intermediate layer is about four to six inches in depth.

7. The method of encasing a hot medium-carrying conduit in a predetermined walled area or ditch, comprising arranging spacers in said area, placing said conduit on said spacers, pouring a mixture into the area to completely surround the conduit, the mixture consisting of high softening point hydrocarbon in a dry powdered state and expanded perlite coated with a similar high softening point hydrocarbon, transmitting heat at a temperature of about 400° F. from the conduit to said mixture, thereby heating the mixture and forming an inner plastic cylindrical layer of said mixture in contact with said conduit, an intermediate substantially solidified layer of said mixture merging into said inner layer, and an outer layer of said mixture in a free or loose state.

8. The method as set forth in any of claims 5, 6 or 7 wherein the expanded perlite is produced by heating perlite ore to a temperature of about 2000° F. to form expanded perlite particles having a mass of cells or voids, allowing the expanded perlite particles to cool to about 600° F., and thereupon blowing a high softening point hydrocarbon in dry powdered form on to the expanded perlite whereupon the powdered hydrocarbon will fuse and adhere to the perlite particles upon contact.

9. The method of encasing hot medium-carrying conduits substantially as described with reference to the accompanying drawings.

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London, W.C.1,
Agents for the Applicant.

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822,714 COMPLETE SPECIFICATION
1 SHEET

*This drawing is a reproduction of the Original on a reduced scale.*

Fig. 1.

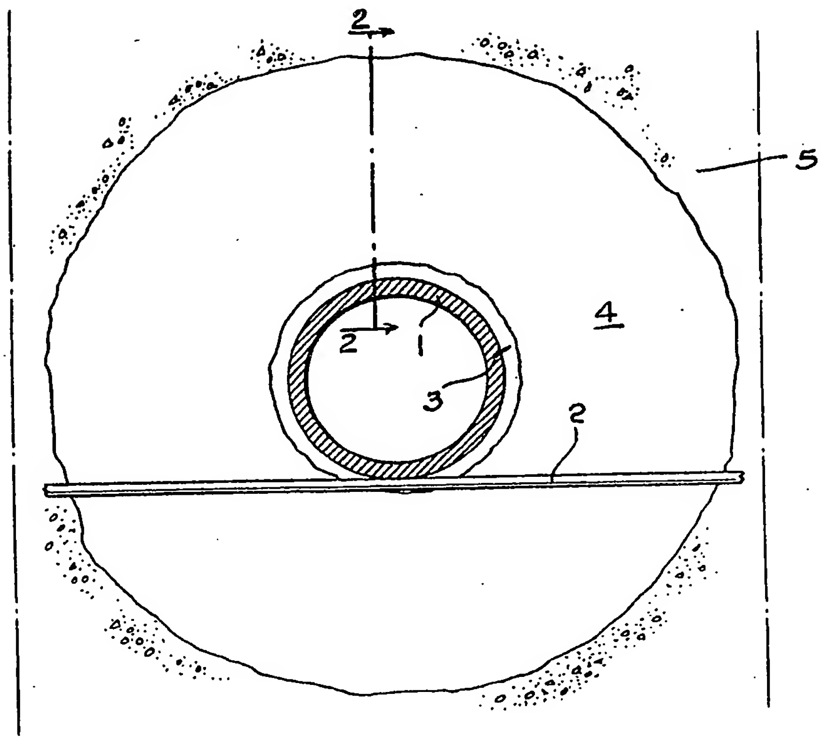


Fig. 2.